

## **AMENDMENTS TO THE SPECIFICATION**

In paragraph [029], please make the following changes as reflected in the following marked-up version of the above listed paragraph:

[029] Figure 2 illustrates an exemplary embodiment of an APD 210 including an absorption layer 212, a field control layer 214, and a gain layer (also referred to as a multiplication zone) 216. A cathode contact 230 and an anode contact 232 are used to apply a bias voltage to the APD 210. An optical signal, usually having a wavelength between 0.9  $\mu\text{m}$  and 1.7  $\mu\text{m}$ , enters the APD 210 from the bottom of Figure 2 (the cathode of APD 210), as shown by an arrow 218. The optical signal first passes through a substrate layer 220 which is transparent to some optical signals to reach the absorption layer 212. An InP layer 222 is formed between the substrate layer 220, which is an  $n^+$  doped InP layer, and the absorption layer 212, which is an InGaAs layer, to keep the two layers separated. The optical signal is absorbed in the absorption layer 212 and one or more electron-hole pairs are generated. The notation "n.i.d." in FIG. [[1]] 2 indicates that the layer is not intentionally doped.

In paragraph [035], please make the following changes as reflected in the following marked-up version of the above listed paragraph:

[035] FIG. 4A and FIG. 4B depict schematically the relative electric field strengths of a high doping thickness product APD and a low doping thickness product APD, respectively. The APD of FIG. 4A and the APD of FIG. 4B have substantially similar outer dimensions. However,  $\Delta E_{\text{low}}$  for an APD with a high doping thickness product [[APD]] is smaller than the  $\Delta E_{\text{hi}}$  for [[the]] an APD with a low doping thickness product. By tailoring the doping concentration in the field control layer 214, one can manipulate the electric field strength difference between the

absorption layer 212 and the gain layer 216 and ultimately the peak sensitivity and the dynamic range of the APD 210.

In paragraph [036], please make the following changes as reflected in the following marked-up version of the above listed paragraph:

[036] Figures 4C and 4D schematically depict APD gain curves. The ADP gain curves graph gain, in amps per Watt, against a bias voltage. By choosing a bias voltage that causes the APD to operate in the avalanche region, effective optical signal amplification can be achieved. Specifically Figure 4C depicts the APD gain curve 410 for an APD with a high doping thickness product. The dynamic range of an APD is determined [[the]] by the size of the avalanche region 412 portion of the gain curve 410. As illustrated by Figure 4C, the dynamic range of the APD with a high doping thickness product is somewhat limited. Figure 4D illustrates an APD gain curve for an APD with a low doping thickness product. By examining the avalanche region 416 of the APD gain curve 414, it is evident that the dynamic range for an APD with a low doping thickness product is considerably wider than the dynamic range for an APD with a high doping thickness product. By varying the bias voltage across the avalanche region, the amount of current per photon in an optical signal can be controlled.

In paragraph [039], please make the following changes as reflected in the following marked-up version of the above listed paragraph:

[039] In some embodiments of the invention, a lower actual peak gain or peak sensitivity may be caused by increasing the dynamic range of the APD [[110]] 210. This loss of peak gain may be counteracted by limiting the fiber length used with a transceiver incorporating an APD with a wide dynamic range, or by compensating for the loss of peak gain by increasing the gain of other components such as the post amplifier and the like.

In paragraph [040], please make the following changes as reflected in the following marked-up version of the above listed paragraph:

[040] FIG. 5 depicts the potential energy levels of an electron in an APD having a high doping thickness product and an electron in an APD having a low doping thickness product. The energy levels are shown as a function of the APD height, the left portion representing the energy level near the anode of the APD ~~[[110]]~~ 210 and the right portion representing the energy level near the cathode of the APD ~~[[110]]~~ 210. The negative slope 502 represents the energy level of an electron in the gain layer 216, and the plateau portion 504 represents the energy level of an electron in the absorption layer 212.

In paragraph [041], please make the following changes as reflected in the following marked-up version of the above listed paragraph:

[041] While the foregoing has been with reference to a particular embodiment of the invention, it will be appreciated by those skilled in the art that changes in this embodiment may be made without departing from the principles and spirit of the invention. For example, the invention is not limited to APDs of the particular compositions and layers depicted in FIG. ~~[[1]]~~ 2 but may be applied to APDs of different compositions and layers.

In paragraph [046], please make the following changes as reflected in the following marked-up version of the above listed paragraph:

[046] The current can be monitored by the feedback loop using several current monitors as depicted by current monitor 616. For example, the current may be measured using a current monitor 616 implemented as a current mirror circuit. Alternatively, a small sensing resistor may be placed in series with the APD 606 and the voltage across the small sensing resistor measured.

According to Ohms law, current passing through the sensing resistor and the APD 606 would cause a proportional voltage across the sensing resistor. This voltage could be fed into the controller 614 for controlling the power supply [[612]] 610. Yet another implementation of current monitor 616 for monitoring the current through the APD 606 may be current transformers and the like.